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ABSTRACT

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advice. The purpose of this study was to explore the nature of health locus of control beliefs of children and to examine the construct validity of the Multidimensional Health Locus of Control Scales (MHLC). The subjects constituted two discrete samples of children in grades four, five, and six. The first sample (N=914) completed the MHLC Scales with simplified sentence structure for some items to improve the usability of the measure with this age group. The second sample (N=390) completed the same modified version of the MHLC Scales and an additional six items from a second measure. Confirmatory maximum-likelihood factor analyses were conducted, and a confirmatory factor analytic analog to analysis of variance was illustrated. Results were generally supportive of the validity of data collected using the MHLC Scales, though some additional item revisions are suggested. (Author/NB)

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THE NATURE OF HEALTH LOCUS OF CONTROL, REVISITED USING CONFIRMATORY FACTOR ANALYTIC METHODS AND TWO SAMPLES: A COVARIANCE METHOD FOR CONFIRMATORY FACTOR ANALYSIS

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Paper presented at the annual meeting of the Southwest Educational Research Association, San Antonio, TX, January 24, 1991. These data were collected as part of the LSU "Heart Smart" study, directed by Gerald S. Berenson, M.D., and Boyd Professor of Medicine.

ABSTRACT

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advise. The purpose of the present study was to explore the nature, i.e., the structure, of the health locus of control beliefs of children, and the construct validity of the Multidimensional Health Locus of Control Scales. The subjects (n_1 = 914, (n_2 = 390) constituted two discrete samples. Confirmatory maximum-likelihood factor analyses were conducted, and a confirmatory factor analytic analog to ANCOVA is illustrated. Results were generally supportive of the validity of data collected using the MHLC Scales, though some additional item revisions are suggested.

People's beliefs about the origins of their health, sometimes referred to as health locus of control, have been shown to influence a variety of important behaviors, including the propensity to engage in effective health maintenance activities, and the willingness to seek and follow medical advise (Riggs & Noland, 1984, p. 431). "Locus of control" first emerged as a generalized construct referring to individuals' beliefs about the origins of their global situations (Rotter, 1968). According to social learning theory, persons who believe that they control their own destinies, i.e., Internals, behave in predictable ways in comparison with their External counterparts, i.e., persons who believe that chance or powerful others determine the outcomes in their lives.

But one consensus that has emerged from this literature is the view that prediction of generalized behavior (i.e., a general approach to life) requires general measures of expectancy, while more specific predictions require more specific measures (health outcomes as against life outcomes more generally, or weight or cardiovascular outcomes as against health outcomes more generally) of locus of control (Lefcourt, 1981, p. 386). B. Wallston, Wallston, Kaplan and Maides (1976, p. 584) argue that, "The more specific the instrument, the better the prediction of a particular behavior in a particular situation." In an empirical study confirming these theoretical expectations, Saltzer (1982, pp. 626-627) used both general and specific locus of control measures and reported that the outcome-specific measures predicted experimental outcomes while locus of control measures that did not deal with beliefs specifically about control of weight "would not have led to the predicted findings."

Strickland (1973) reviewed 11 studies investigating linkages between health locus of control beliefs and outcomes and reported that there are positive relationships between a more Internal locus of control and physical health or well being. In one of the first studies employing locus of control as a predictor variable, Seeman and Evans (1962) found that hospitalized tuberculosis patients who were more Internal knew more about their conditions, questioned health professionals more for information, and expressed less satisfaction about the information they were getting regarding their conditions. Similarly, in a study with epileptics, DeVellis, DeVellis, Wallston and Wallston (1980) found that information-seeking behaviors were associated in theoretically expected ways with locus of control scores.

K. Wallston, Wallston and DeVellis (1978) developed what is probably the most frequently used measure of beliefs about health locus of control, i.e., the Multidimensional Health Locus of Control (MHLC) Scales. The MHLC Scales consider three origins of health: (a) Internal, (b) Chance, and (c) Powerful Others. As Russell and Ludenia (1983, pp. 453-454) note, "The MHLC Scales have been employed in a substantial number of studies that investigated various health conditions and health-related behaviors with a wide range of populations."

Several researchers have examined the measurement integrity of the MHLC Scales, or of revisions of the scales. For example, the internal consistency reliability of the Scales has been investigated (Marshall, Collins & Crooks, 1990; Thompson, Butcher & Berenson, 1987). The construct validity of the scales has also been investigated using various factor analytic methods, including principal components analysis (Marshall et al., 1990; Thompson et al., 1987), second-order exploratory factor analysis (Thompson, Webber & Berenson, 1990), and confirmatory first-order factor analysis (Thompson, Webber & Berenson, 1987, 1988).

Factor analytic studies of measurement integrity are important, as Nunnally (1978, pp. 111-112) notes:

> construct validity has been spoken of as "trait validity" and "factorial validity.... Factor analysis is intimately involved with questions of validity... Factor analysis is at the heart of the measurement of psychological constructs.

Gorsuch (1983, pp. 350-351, emphasis added) concurs, noting that "A prime use of factor analysis has been in the development of <u>both</u> the theoretical constructs for an area and the operational representatives for the theoretical constructs." Similarly, Hendrick and Hendrick (1986, p. 393) note that "theory building and construct measurement are joint bootstrap operations." Factor analysis at once both tests measurement integrity and sheds light on underlying theory.

Confirmatory factor analytic methods are particularly important, because these methods overcome the tendency of exploratory methods to capitalize on measurement error. However, confirmatory factor analytic methods do tend to require fairly large sample sizes (Baldwin, 1989) not always available to researchers.

Purpose of the Present Study

The purpose of the present study was to explore the nature, i.e., the structure, of the health locus of control beliefs of children. The three-factor model proposed by K. Wallston et al. (1978) is very straightforward, but previous empirical results suggest that the measure may be more factorially complex than they posited (cf. Thompson et al., 1990). Furthermore, it may be particularly important to employ confirmatory methods in these investigations, because previous studies (Marshall, Collins & Crooks, 1990; Thompson, Butcher & Berenson, 1987) suggest that children may not yield data with quite the reliability one might prefer.

Table 1 presents bivariate correlation coefficients across summated raw subscale scores on the MHLC measure across four studies. The results suggest that these relationships tend to be somewhat unstable. Nevertheless, in two of the four studies (Larde & Clopton, 1983, $\underline{r}^2$ = 28%; Thompson, Butcher & Berenson, 1987, $\underline{r}^2$ = 17%) the correlation between Chance and Powerful Others involved a large effect size, in relation to typical effect sizes reported in the literature (Cohen, 1988; Glass, 1979). This result is sensible, since Chance and Powerful Others are both external dynamics.

INSERT TABLE 1 ABOUT HERE.

The related work with Rotter's general locus of control measure (as against health more specifically) also suggests that locus of control is factorially complex. Marsh and Richards (1987) reviewed 20 published studies in which exploratory factor analytic methods were employed, and then tested several models using confirmatory methods. They found empirical support for the fit of a model involving as many as six factors: General Luck, Political Control, Success via Personal Initiative, Interpersonal Control, Academic Situations, and Occupational Situations.

Since previous inquiry has not met with unconditional success in delineating the structure underlying the health locus of control beliefs of children, three somewhat different tacks were taken in the present study. First, we employed two independent samples ($\underline{n}_1$ = 914; $\underline{n}_2$ = 390) of subjects. Second, we employed an expanded item pool ($\underline{v}_1$ = 18; $\underline{v}_2$ = 24) in our replication study. The importance of these study features was noted by Gorsuch (1983, p. 335, emphasis added):

> To the extent that invariance can be found across systematic changes in *either variables or individuals* [or both], then the factors have a wider range of applicability as generalized constructs. The subpopulations over which the factor occurs could--and probably would--differ in their mean scores or variances across the groups, but the

pattern of relationships among the variables would be the same. The factors would be applicable to the several populations and could be expected to generalize to other similar populations as well.

Third, given the ambiguity of previous results, a factor analytic variation on analysis of covariance was employed in the present study. Though rarely used (and perhaps never used in the form presented here), this factor analytic approach may be useful even though conventional ANCOVA usually isn't useful (Loftin & Madison, 1991). Gorsuch (1983, p. 89-90) explains how this can be done in the exploratory analytic case:

> The first factor extracted is [forcibly] passed through the variable [or variables] measuring that which is to be held constant... Factors extracted from this residual matrix will all be uncorrelated with the variable held constant.

A logically related procedure would be to fix the position of a factor axis through the "covariate" factor, and then rotate the remaining factors orthogonally. It was felt that creating a fourth factor involving the combination of Chance and Powerful Others, and imposing a restriction that this factor would be orthogonal to all others, might be useful in exploring the relationship between these two constructs.

Method

Subjects

The demographic characteristics of the two samples are described in Table 2. The two samples had no subjects in common. The second sample participating in the study completed instrumentation one year after the first sample, but consisted of students from the same four schools. The second sample excluded the previous year's sixth-graders, included newly promoted fourth-graders, and included new fifth- and sixth-graders new to the schools or absent at the initial testing one year previously. The samples appear to be reasonably similar in their makeup.

INSERT TABLE 2 ABOUT HERE.

Instrumentation

Unfortunately, the MHLC Scales were developed for use by adults, although the items were written at a 5th-6th grade reading level, as assessed by the Dale-Chall "readability" formula (K. Wallston, Wallston & DeVellis, 1978, p. 162). Since the present study investigated the nature of health locus of control when elementary students are subjects, some wording changes were made in 10 of the 18 MHLC items to improve the usability of the measure with this age group. Most of these changes involved simplifying sentence structure. Minimal changes were made because an important aspect of the effort was to facilitate the use of the MHLC Scales with both children and adults so that results of substantive studies could be generalized across groups via the use of the same instrument or very similar instruments. Four-point Likert scales ("disagree very much" = 1 to "agree very much" = 4) were employed to maximize response variance and thus reliability; other researchers have tended to employ "yes-no" response formats.

The second sample of subjects, who participated one year later, completed the same 18 MHLC items and an additional six items (two per scale) from the measure developed by Parcel and Meyer (1978). Although the Parcel and Meyer (1978) measure has been criticized on several grounds (Thompson, Webber & Berenson, 1987, pp. 81-82), primarily for too much redundancy in item wording, these additional items were employed to better mark the positions of the factors in factor space. Theoretically this improves the invariance of factors. The six items selected were highly correlated with scale scores, were written for use with children, and were not exactly the same in their wording. We did not want the factors to emerge as an artifact of wording similarity.

Results

Confirmatory maximum-likelihood model tests were conducted with the LISREL program described by Jöreskog and Sörbom (1986). Model tests were based on the correlation matrices. Three models were fit to the data for both of the samples: (a) a model positing the existence of three uncorrelated factors (the six (or eight) Internal items being associated only with an Internal factor; the six (or eight) Chance items being associated only with a Chance factor; and the six (or eight) Powerful Others items being correlated only with a Powerful Others factor), Model 1 and Model 4; (b) a model positing the existence of three correlated factors, Model 2 and Model 5; and (c) a model positing four factors, the first three factors with the same structure as in the previous analyses, and a fourth factor involving both the Chance and Powerful Others items, and with this fourth factor constrained to be uncorrelated with all other factors, i.e., Model 3 and Model 6. This last constraint is equivalent to a covariance restriction, except that in classical covariance methods the covariance adjustments are made first, while in this model testing all model constraints are imposed simultaneously. Thus, results here were conditioned by the data, and not conditioned by a hierarchical approach to analysis (as in ANCOVA), since the latter approach can sometimes distort interpretations (Loftin & Madison, 1991).

Table 3 presents the statistics evaluating the fit to the data of the models. Tables 4 through 9 present the maximum-likelihood estimates from the analyses. Coefficients may be noteworthy when they are several times their standard errors, so the standard errors are reported in parentheses next to each estimate. Results without standard errors were fixed to either zero in the case of factor matrices, or to one in the case of the diagonal of the interfactor correlation matrices, as is typical practice.

INSERT TABLES 3 THROUGH 9 ABOUT HERE.

Tables 10 and 11 present the items deemed salient (estimate > |.3|) to the factors posited in Models 3 and 6. Each of these estimates was also several times their standard errors, as reported in Tables 6 and 9.

INSERT TABLES 10 AND 11 ABOUT HERE.

Discussion

As Neale and Liebert (1986, p. 290) emphasize, it is important to recognize that

> No one study, however shrewdly designed and carefully executed, can provide convincing support for a causal hypothesis or theoretical statement in the social sciences... How, then, does social science theory advance through research? The answer is, by collecting a diverse body of evidence about any major theoretical proposition.

One unique feature of the present study was the attempt to address such concerns by analyzing two discrete sets of data.

The fit statistics reported in Table 3 suggest that Models 3 (fit = .96) and 6 (fit = .92) provided the best fit to the two data sets. Thus, the covariate model had some utility for these data. However, as suggested by results reported in Tables 10 and 11, the factors emerged as somewhat different constructs in these analyses. In both analyses the Internal scale emerged as a factor that might best be labelled "Prevention," since items involving prevention of illness were most associated with the factor.

The Powerful Others factor emerged as expected, but in different locations in the two analyses. In the Model 3 analysis involving 914 subjects' responses to 18 items, reported in Tables

6 and 10, this scale emerged as Factor III. In the Model 6 analysis involving 390 subjects' responses to 24 (18 + 6) items, reported in Tables 9 and 11, "Powerful Others" emerged as Factor IV, the factor on which the 16 (8 + 8) Powerful Others and Chance items' loadings were free to be estimated. However, the six items most associated with this combination factor were Powerful Others items.

In the Model 3 test involving 914 subjects' responses to 18 items, the Chance scale emerged in both Factor II, a singleton factor labelled "Fate," and in Factor IV, which also involved two items from the Powerful Others scale. In the Model 6 test involving 390 subjects' responses to 24 items, the Chance items were primarily useful in delineating Factor II, which might be labelled "Luck," and might be associated with the "General Luck" dimension isolated by Marsh and Richards (1987). Factor III in the Model 6 test emerged as a construct that might be labelled, "Initiative," and which may resemble the "Personal Initiative" factor isolated by Marsh and Richards (1987).

Although both the "covariate" models yielded some intriguing insights regarding the nature of health locus of control, it is moderately disturbing that somewhat different results occurred in the two samples. Of course, this was partly due to the use of more items to mark the factors in the tests of Models 4 through 6. It must also be noted that the fits of the models positing three correlated factors (.93 and .90) were only slightly worse than the fits of Models 3 and 6 (.96 and .92, respectively), as reported in Table 3.

The principle of parsimony might argue in favor of the interpretation of the Models 2 and 5, reported in Tables 5 and 8. Nearly all the items were substantially associated with the expected factors, and the loadings tended to be several times their standard errors. These results suggest that Internal and Chance factors are very minimally related ($r^2 < 5\%$), that the relationship between Internal and Powerful Others is moderate and negative, and that the relationship between Chance and Powerful Others is positive but more variable across samples.

The Table 5 and 8 results also both suggest that three items were not appreciably related with the expected factors. These were MHLC item 12, an Internal item, and items 3 and 16, both Chance items. These items may require revision, or might best be dropped from their scales. For example, item 12, "When I am sick, I am to blame," may measure susceptibility to guilt more than a feeling of personal control. Item 3, "No matter what I do, if I am going to get sick I will get sick," and item 16, "I am likely to get sick no matter what I do," both deal with getting sick "no matter what I do." This phrase appears to provide a cue tapping the Internal dimension, and these items might be more consistent if they referred instead to dynamics of chance or luck.

In summary, the results in the present study suggest that the revised MHLC scales provide useful measures of the health locus of control beliefs of children. The measures may be more useful if used in conjunction with some of the Parcel and Meyer (1978) items. And some additional wording changes may also be useful.

Nevertheless, the results do suggest that health locus of control beliefs are indeed factorially complex, and that the primary dimensions underlying these beliefs are somewhat correlated. And the results indicate that the expected models had reasonable fits to the data, suggesting that the measure may be useful in the evaluation of program intervention effects, as Parcel and Meyer (1978, p. 149) note, or in assigning children to intervention modalities, as Riggs and Noland (1984, p. 434) argue.

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Table 1
Bivariate r Matrices Among Raw Scale Scores

	Internal	Chance
Chance	-.21 (4%)[a]	
	-.06 (0%)[b]	
	-.13 (2%)[c]	
	-.34 (12%)[d]	
PwOthers	-.23 (5%)[a]	.41 (17%)[a]
	.18 (3%)[b]	.53 (28%)[b]
	.26 (7%)[c]	.05 (0%)[c]
	.15 (2%)[d]	.06 (0%)[d]

[a]From Thompson, Butcher & Berenson (1987). $\underline{n}$ = 876, a subset of the $\underline{n}_1$ = 914 sample in the present study.
[b]From Larde & Clopton (1983).
[c]From Russell and Ludenia (1983).
[d]From Wallston et al. (1978).

Table 2
Sample Characteristics

	Sample #1 (n=914)	Sample #2 (n=390)
Gender		
Females	464 (50.8%)	197 (50.5%)
Race		
White	461 (50.4%)	259 (66.4%)
Black	331 (36.2%)	92 (23.6%)
Hispanic	56 (6.1%)	31 (7.9%)
Oriental	63 (6.9%)	7 (1.8%)
Other	3 (.3%)	1 (.3%)
Grade		
4th	309 (33.8%)	157 (40.3%)
5th	350 (38.3%)	159 (40.8%)
6th	255 (27.9%)	74 (19.0%)

Table 3
Summary of Model Tests

Model	n	v	F	phi	df	chi2	df/chi2 Ratio	Δdf	Δchi	delta Ratio	Fit
1	914	18	3	ID	135	736.64	5.46				.91
2	914	18	3	SYM	132	548.00	4.15	3	188.6	62.9	.93
3	914	18	4	SYM	120	360.74	3.01	12	187.3	15.6	.96
4	390	24	3	ID	252	530.00	2.10				.89
5	390	24	3	SYM	249	504.25	2.02	3	25.8	8.6	.90
6	390	24	4	SYM	233	379.83	1.63	16	124.4	7.8	.92

Table 4
Maximum-Likelihood Solution Positing Three Uncorrelated Factors
(n = 914; v = 18)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS
H01-1	.308(.048)	.000	.000
H01-2	.227(.048)	.000	.000
H01-3	.000	.134(.041)	.000
H01-4	.000	.000	.433(.040)
H01-5	.000	.000	.332(.040)
H01-6	.566(.059)	.000	.000
H01-7	.364(.049)	.000	.000
H01-8	.000	.597(.047)	.000
H01-9	.388(.050)	.000	.000
H01-10	.000	.292(.041)	.000
H01-11	.000	.000	.608(.039)
H01-12	.071(.047)	.000	.000
H01-13	.000	.598(.050)	.000
H01-14	.000	.000	.465(.039)
H01-15	.000	.000	.452(.039)
H01-16	.000	.194(.041)	.000
H01-17	.000	.312(.041)	.000
H01-18	.000	.000	.563(.039)

Table 5
Maximum-Likelihood Solution Positing Three Correlated Factors
(n = 914; v = 18)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS
H01-1	.278(.046)	.000	.000
H01-2	.188(.046)	.000	.000
H01-3	.000	.160(.041)	.000
H01-4	.000	.000	.419(.038)
H01-5	.000	.000	.342(.039)
H01-6	.588(.053)	.000	.000
H01-7	.393(.047)	.000	.000
H01-8	.000	.592(.040)	.000
H01-9	.362(.046)	.000	.000
H01-10	.000	.309(.040)	.000
H01-11	.000	.000	.576(.037)
H01-12	.110(.045)	.000	.000
H01-13	.000	.627(.041)	.000
H01-14	.000	.000	.504(.038)
H01-15	.000	.000	.431(.038)
H01-16	.000	.221(.041)	.000
H01-17	.000	.383(.040)	.000
H01-18	.000	.000	.581(.037)

PHI

	INTERNAL	CHANCE	PWOTHERS
INTERNAL	1.000		
CHANCE	-.213(.059)	1.000	
PWOTHERS	-.422(.054)	.604(.043)	1.000

Note. The factor matrix is designated LAMBDA X; the interfactor correlation matrix is designated PHI.

Table 6
ML Solution Positing Three Factors, Some Uncorrelated
(n = 914; v = 18)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS	COMBINAT
H01-1	.288(.043)	.000	.000	.000
H01-2	.158(.043)	.000	.000	.000
H01-3	.000	.058(.050)	.000	.172(.042)
H01-4	.000	.000	.528(.042)	.045(.047)
H01-5	.000	.000	.249(.043)	.238(.042)
H01-6	.633(.048)	.000	.000	.000
H01-7	.351(.043)	.000	.000	.000
H01-8	.000	.081(.054)	.000	.620(.041)
H01-9	.371(.043)	.000	.000	.000
H01-10	.000	.226(.055)	.000	.240(.043)
H01-11	.000	.000	.587(.042)	.209(.047)
H01-12	.061(.043)	.000	.000	.000
H01-13	.000	.159(.055)	.000	.576(.041)
H01-14	.000	.000	.238(.046)	.527(.041)
H01-15	.000	.000	.492(.042)	.093(.046)
H01-16	.000	.017(.050)	.000	.250(.042)
H01-17	.000	.425(.081)	.000	.261(.049)
H01-18	.000	.000	.398(.044)	.412(.043)

PHI

	Prevention	Fate	PWOTHERS	External
Preventi	1.000			
Fate	-.809(.153)	1.000		
PWOTHERS	-.570(.054)	.555(.110)	1.000	
External	.000	.000	.000	1.000
	[22.649]	[00.000]	[00.000]	

Note. The factor matrix is designated LAMBDA X; the interfactor correlation matrix is designated PHI. The "modification index," i.e., the improvement in the Model 6 chi^2 reported in Table 3, resulting from relaxing the constraint that a given coefficient is fixed, is presented in [square brackets]. Lower-case factor names presented in the PHI matrix were formulated after interpreting the LAMBDA X factor matrix.

Table 7
Maximum-Likelihood Solution Positing Three Uncorrelated Factors
(n = 390; v = 24)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS
H03-1	.372 (.067)	.000	.000
H03-2	.322 (.067)	.000	.000
H03-3	.000	.228 (.059)	.000
H03-4	.000	.000	.434 (.060)
H03-5	.000	.000	.155 (.061)
H03-6	.411 (.067)	.000	.000
H03-7	.153 (.067)	.000	.000
H03-8	.000	.653 (.055)	.000
H03-9	.516 (.069)	.000	.000
H03-10	.000	.437 (.057)	.000
H03-11	.000	.000	.621 (.059)
H03-12	.004 (.067)	.000	.000
H03-13	.000	.618 (.055)	.000
H03-14	.000	.000	.235 (.061)
H03-15	.000	.000	.419 (.060)
H03-16	.000	.184 (.059)	.000
H03-17	.000	.297 (.058)	.000
H03-18	.000	.000	.352 (.060)
H03-19	.464 (.068)	.000	.000
H03-20	.000	.553 (.056)	.000
H03-21	.000	.000	.563 (.059)
H03-22	.000	.552 (.056)	.000
H03-23	.368 (.067)	.000	.000
H03-24	.000	.000	.479 (.059)

Table 8
Maximum-Likelihood Solution Positing Three Correlated Factors
(n = 390; v = 24)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS
H03-1	.379(.066)	.000	.000
H03-2	.304(.066)	.000	.000
H03-3	.000	.233(.059)	.000
H03-4	.000	.000	.439(.059)
H03-5	.000	.000	.186(.061)
H03-6	.447(.066)	.000	.000
H03-7	.171(.066)	.000	.000
H03-8	.000	.657(.054)	.000
H03-9	.508(.066)	.000	.000
H03-10	.000	.427(.057)	.000
H03-11	.000	.000	.629(.058)
H03-12	-.023(.066)	.000	.000
H03-13	.000	.617(.055)	.000
H03-14	.000	.000	.234(.061)
H03-15	.000	.000	.433(.059)
H03-16	.000	.190(.059)	.000
H03-17	.000	.302(.058)	.000
H03-18	.000	.000	.348(.060)
H03-19	.472(.066)	.000	.000
H03-20	.000	.549(.055)	.000
H03-21	.000	.000	.547(.058)
H03-22	.000	.554(.055)	.000
H03-23	.316(.066)	.000	.000
H03-24	.000	.000	.461(.059)

PHI

	INTERNAL	CHANCE	PWOTHERS
INTERNAL	1.000		
CHANCE	.124(.078)	1.000	
PWOTHERS	-.346(.077)	.160(.071)	1.000

Note. The factor matrix is designated LAMBDA X; the interfactor correlation matrix is designated PHI.

Table 9

ML Solution Positing **Three** Factors, **Some Uncorrelated**

($\underline{n}$ = 390; $\underline{v}$ = 24)

LAMBDA X

	INTERNAL	CHANCE	PWOTHERS	COMBINAT
H03-1	**.379**(.065)	.000	.000	.000
H03-2	**.300**(.065)	.000	.000	.000
H03-3	.000	.224(.061)	.000	.093(.064)
H03-4	.000	.000	**.467**(.076)	.299(.083)
H03-5	.000	.000	-.130(.075)	.290(.062)
H03-6	**.434**(.065)	.000	.000	.000
H03-7	.169(.066)	.000	.000	.000
H03-8	.000	**.558**(.063)	.000	**.319**(.076)
H03-9	**.516**(.066)	.000	.000	.000
H03-10	.000	**.389**(.060)	.000	.161(.069)
H03-11	.000	.000	**.338**(.093)	**.526**(.072)
H03-12	-.023(.066)	.000	.000	.000
H03-13	.000	**.526**(.062)	.000	.298(.074)
H03-14	.000	.000	**-.386**(.091)	**.475**(.079)
H03-15	.000	.000	.195(.081)	**.383**(.064)
H03-16	.000	.172(.061)	.000	.077(.063)
H03-17	.000	.156(.067)	.000	**.312**(.062)
H03-18	.000	.000	-.119(.088)	**.465**(.061)
H03-19	**.468**(.065)	.000	.000	.000
H03-20	.000	**.599**(.058)	.000	.147(.077)
H03-21	.000	.000	.230(.088)	**.460**(.065)
H03-22	.000	**.521**(.060)	.000	.201(.074)
H03-23	**.335**(.065)	.000	.000	.000
H03-24	.000	.000	.281(.079)	**.357**(.069)

PHI

	Preventi	Luck	Initiati	PwOthers
Preventi	1.000			
Luck	.210(.083)	1.000		
Initiati	-.513(.090)	-.576(.099)	1.000	
PwOthers	.000	.000	.000	1.000
	[19.377]	[00.000]	[00.000]	

Note. The factor matrix is designated LAMBDA X; the interfactor correlation matrix is designated PHI. The "modification index," i.e., the improvement in the Model 6 chi^2 reported in Table 3, resulting from relaxing the constraint that a given coefficient is fixed, is presented in [square brackets]. Lower-case factor names presented in the PHI matrix were formulated after interpreting the LAMBDA X factor matrix.

Table 10
Items Deemed Salient (Estimate > |.3|) to Factors
in the Test of Model 3 ($\underline{n}$ = 914; $\underline{v}$ = 18)

Factor I: "Prevention"			
.633	6*	"I"	If I take the right actions, I can stay healthy.
.371	9*	"I"	If I take care of myself I can avoid illness.
.351	7	"I"	The main thing which affects my health is what I do.
Factor II: "Fate"			
.425	17*	"C"	If it's meant to be, I will stay healthy.
Factor III: "Powerful Others"			
.587	11	"P"	Whenever I don't feel well, I should see a doctor or a nurse.
.528	4	"P"	The best way to keep from getting sick is to have regular medical checkups.
.492	15	"P"	When I get well it's usually because other people (like family, friends, doctors, or nurses) have been taking care of me.
.398	18	"P"	I can only do what my doctor tells me to do about my health.
Factor IV: "External"			
.620	8	"C"	My good health is mostly a matter of good luck.
.576	13	"C"	Luck is mostly what determines how soon I will recover from an illness.
.527	14	"P"	Doctors and nurses control my health.
.412	18	"P"	I can only do what my doctor tells me to do about my health.

Note. Items with no wording changes from the original MHLC Scales are designated with asterisks. Items from Parcel and Meyer (1978) are designated with pound signs. With respect to item identification with the three scales, "I" = Internal; "C" = Chance; "P" = Powerful Others.

Table 11

Items Deemed Salient (Estimate > |.3|) to Factors in the Test of Model 6 (n = 390; v = 24)

Factor I: "Prevention"			
.516	9*	"I"	If I take care of myself I can avoid illness.
.468	19#	"I"	I can do many things to prevent illness. (Parcel & Meyer #11)
.434	6*	"I"	If I take the right actions, I can stay healthy.
.379	1*	"I"	I am in control of my own health.
.335	23#	"I"	I can make choices about my health. (Parcel & Meyer #16)
.300	2	"I"	My own actions mostly determine how soon I will recover from an illness.
Factor II: "Luck"			
.599	20#	"C"	Bad luck makes people get sick. (Parcel & Meyer #3)
.558	8	"C"	My good health is mostly a matter of good luck.
.526	13	"C"	Luck is mostly what determines how soon I will recover from an illness.
.521	22#	"C"	People who never get sick are just plain lucky. (Parcel & Meyer #6)
Factor III: "Initiative"			
.467	4	"P"	The best way to keep from getting sick is to have regular medical checkups.
-.386	14	"P"	Doctors and nurses control my health.
.338	11	"P"	Whenever I don't feel well, I should see a doctor or a nurse.
Factor IV: "Powerful Others"			
.526	11	"P"	Whenever I don't feel well, I should see a doctor or a nurse.
.475	14	"P"	Doctors and nurses control my health.
.465	18	"P"	I can only do what my doctor tells me to do about my health.
.460	21#	"P"	I always go to the nurse right away if I get hurt at school. (Parcel & Meyer #14)
.383	15	"P"	When I get well it's usually because other people (like family, friends, doctors, or nurses) have been taking care of me.
.357	24#	"P"	Whenever I feel sick, I go to see the school nurse right away. (Parcel & Meyer #18)
.319	8	"C"	My good health is mostly a matter of good luck.
.312	17*	"C"	If it's meant to be, I will stay healthy.

Note. Items with no wording changes from the original MHLC Scales are designated with asterisks. Items from Parcel and Meyer (1978) are designated with pound signs. With respect to item identification with the three scales, "I" = Internal; "C" = Chance; "P" = Powerful Others.

APPENDIX A:
Expected Structure for Items

Category/ No.	Item
Internal	
1*	I am in control of my own health.
2	My own actions mostly determine how soon I will recover from an illness.
6*	If I take the right actions, I can stay healthy.
7	The main thing which affects my health is what I do.
9*	If I take care of myself I can avoid illness.
12*	When I get sick, I am to blame.
19#	I can do many things to prevent illness. (Parcel & Meyer #11)
23#	I can make choices about my health. (Parcel & Meyer #16)
Chance	
3*	No matter what I do, if I am going to get sick I will get sick.
8	My good health is mostly a matter of good luck.
10*	Most things that affect my health happen to me by accident.
13	Luck is mostly what determines how soon I will recover from an illness.
16	I am likely to get sick no matter what I do.
17*	If it's meant to be, I will stay healthy.
20#	Bad luck makes people get sick. (Parcel & Meyer #3)
22#	People who never get sick are just plain lucky. (Parcel & Meyer #6)
Powerful Others	
4	The best way to keep from getting sick is to have regular medical checkups.
5*	My family has a lot to do with my becoming sick or staying healthy.
11	Whenever I don't feel well, I should see a doctor or a nurse.
14	Doctors and nurses control my health.
15	When I get well it's usually because other people (like family, friends, doctors, or nurses) have been taking care of me.
18	I can only do what my doctor tells me to do about my health.
21#	I always go to the nurse right away if I get hurt at school. (Parcel & Meyer #14)
24#	Whenever I feel sick, I go to see the school nurse right away. (Parcel & Meyer #18)

Note. Items with no wording changes from the original MHLC Scales are designated with asterisks. Items from Parcel and Meyer (1978) are designated with pound signs.